Scientists find missing link in regulation of glucose

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(Medical Xpress) -- A team led by USC neuroscientist Alan Watts identified for the first time a biochemical signal that helps regulate the amount of glucose in the blood.

A better understanding of the way the body naturally deals with incorrect levels of glucose could lay the foundation for better treatments for Type 1 diabetes — which occurs when a person is unable to produce the glucose-regulating hormone, insulin.

“There’s a lot of interest in the field to determine how the brain detects and reacts to changes in blood glucose,” said Watts, professor of neurobiology in USC Dornsife.

Watts and his team discovered that enzymes known as mitogen-activated protein kinases form a critical link between changes in blood glucose levels, certain neurons in the hypothalamus and the release of glucose-controlling hormones.

“Nobody has shown that before,” Watts said.

Understanding, in detail, the way in which these neurons make necessary adjustments to blood glucose levels will provide important new insights into the complications of Type 1 diabetes, Watts said.

Currently, the way that Type 1 patients can cope with hyperglycemia (too much glucose in the blood) is by giving themselves insulin shots.

Insulin moves glucose out of the bloodstream and locks it up as glycogen in liver and muscle tissue. The problem, Watts said, is that the insulin therapy itself can sometimes be problematic, resulting in hypoglycemia (too little glucose in the blood) and even further complications.

There has to be a better way, Watts said.

To explore the way the body normally balances between hyper- and hypoglycemia, Watts and his team studied neurons in the brains of rats.

Neurons use electrical impulses and neurochemicals to communicate within the nervous system. Corticotropin-releasing hormone (CRH) neurons in the hypothalamus — a part of the brain that connects the nervous system to the hormone-secreting endocrine system — are "the head of the mammalian stress response," Watts said. "They drive the release of glucocorticoid, which is a critical hormone for maintaining normal blood glucose."

So when glucose levels in the blood fall (a form of stress), the brain sends signals to the CRH neurons telling them to release glucocorticoid to help compensate.

"These neurons receive inputs from many parts of the brain," Watts said, "but a single set of inputs from the hindbrain appears critical for driving CRH neurons during hypoglyclemia. The lower the blood glucose, the stronger the stress, so they release more hormones."

Watts' article appears in the Dec. 14 issue of *The Journal of Neuroscience*.

Provided by USC College